

NON-PUBLIC?: N  
ACCESSION #: 9110280223  
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Browns Ferry Unit 2 PAGE: 1 OF 5

DOCKET NUMBER: 05000260

TITLE: Failed Soldered Connection on Air Supply Line to Steam Packing  
Exhauster Bypass Flow Control Valve Resulted in Engineered Safety  
Feature Actuation

EVENT DATE: 09/14/91 LER #: 91-017-00 REPORT DATE: 10/15/91

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: N POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR  
SECTION:  
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: James E. Wallace, Compliance TELEPHONE: (205) 729-7874  
Licensing Engineer

COMPONENT FAILURE DESCRIPTION:

CAUSE: SYSTEM: COMPONENT: MANUFACTURER:  
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

On September 14, 1991 at 1832 hours, with Unit 2 operating at 100 percent power, an automatic reactor scram occurred on low reactor water level. The low water level was caused by a momentary loss of reactor feedwater. The loss of reactor feedwater was a result of a failed soldered connection on the air supply line to the steam packing exhauster bypass flow control valve (FCV) allowing the FCV to close. The loss of flow condition subsequently caused 'A' and 'B' condensate booster pumps and 'A' and 'B' reactor feed pumps to trip on low suction pressure. This event is reportable in accordance with 10 CFR 50.73(a)(2)(iv) as a condition which resulted in manual or automatic actuation of engineered safety features including the reactor protection system.

The root cause of this event was poor workmanship on the failed air

supply line soldered connection. TVA's analysis determined that the bonded area of the failed solder joint was less than 15 percent.

The soldered connection was repaired. Those required soldered connections in air supply lines whose failure could cause a reactor scram will be inspected by visual examination using liquid leak detection solution.

END OF ABSTRACT

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## I. PLANT CONDITIONS

Unit 2 was in power operations at approximately 100 Percent reactor thermal power. Units 1 and 3 were shutdown and defueled.

## II. DESCRIPTION OF EVENT

### A. Event:

On September 14, 1991 at 1832 hours, a "Condensate Booster Pump Suction Pressure Low" alarm was received in the control room. This alarm occurred when the steam packing exhauster bypass flow control valve 2-FCV-2-190! closed due to loss of control air. Closure of this valve reduced water flow to condensate booster pumps 'A' and 'B' SF! causing the pumps to trip because of a low net positive suction head (NPSH). Loss of the condensate booster pumps caused reactor feedwater pumps 'A' and 'B' SK! to trip on low NPSH. Loss of the reactor feedwater pumps caused the reactor water level to decrease to the low water level scram setpoint.

At 1833 hours, the reactor scrambled on low reactor vessel water level. At this time, valve 2-FCV-2-190 was observed by light indication as closed. Reactor vessel pressure decreased to approximately 850 psig. The Reactor Water Level decreased to approximately zero (0) inches on normal and emergency instruments. Reactor water level was restored to normal using 'C' reactor feedwater pump. At 1843 hours the scram was reset. Safety systems and features actuated as designed.

At 1853 hours, 2-FCV-2-190 was found with its air supply line separated. The air line was temporarily repaired and to ensure the valve would not close, it was dogged open. This would ensure NPSH would be available for the condensate booster

pumps.

This event is reportable in accordance with 10 CFR 50.73(a)(2)(iv) as a condition which resulted in manual or automatic actuation of engineered safety features including the reactor protection system.

B. Inoperable Structures, Components or Systems that Contributed to the Event:

Air supply line to the steam packing exhauster bypass FCV.

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C. Dates and Approximate Times of Major Occurrences:

1. September 14, 1991 at 1832 CST Air supply tubing elbow joint to 2-FCV-2-190 separated; 2-FCV-2-190 fails closed.

2. September 14, 1991 at 1833 CST Unit 2 reactor scrammed on low reactor water level.

3. September 14, 1991 at 1929 CST A one-hour report was made per 10 CFR 50.72(c)(1)(iii).  
A four-hour report was made in accordance with 10 CFR 50.72(b)(2)(ii).

D. Other Systems or Secondary Functions Affected:

None.

E. Method of Discovery:

The event was immediately known to the control room operator upon receiving a "Condensate Booster Pump Suction Pressure Low" alarm.

F. Operator Actions:

Operators stabilized reactor vessel, water level, reset Primary Containment Isolation System (PCIS) JM!, reactor protection system JC!, the reactor scram, and implemented scram recovery actions.

#### G. Safety System Responses:

1. Reactor protection system initiated a scram on reactor low water level.
2. PCIS groups 2, 3, 6 and 8 isolated.
3. Standby gas treatment system BH! initiated.
4. Control room emergency ventilation VI! initiated.

### III. CAUSE OF THE EVENT

#### A. Immediate Cause:

The immediate cause of this event was the failure of a soldered connection on the air supply line to the steam packing exhauster bypass FCV. This

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caused the loss of NPSH on the 'A' and 'B' condensate booster pumps and subsequently to the 'A' reactor feedwater pumps. Loss of reactor feedwater led to a decrease in the reactor vessel water level to the low ' ' water level scram setpoint.

#### B. Root Cause:

The root cause of this event has been determined to be poor workmanship on the failed air supply line connection. This soldered connection appears to have been installed during original construction of Unit 2 by Engineering Change Notice M0199. Metallurgical analysis of the air supply line concluded that the soldered connection failed as a result of an inadequately bonded solder connection. TVA's analysis determined that the bonded area of the failed solder joint was less than 15 percent.

### IV. ANALYSIS OF THE EVENT

A reactor low water level event is an analyzed condition. The reactor trip occurred as it should have following the reactor low water level condition. No safety limits were violated and there are no nuclear safety issues as a result of this event. The health and safety of the public was not adversely affected, and there were no

adverse consequences or safety implications resulting from this event.

## V. CORRECTIVE ACTIONS

### A. Immediate Corrective Actions:

The air supply line to 2-FCV-2-190 was repaired in accordance with the current TVA solder program which requires qualified solderers to perform solder repairs.

### B. Corrective Actions to Prevent Recurrence:

1. TVA will inspect, by visual examination using liquid leak detection solution, readily accessible control air system soldered connections whose failure could cause a reactor scram.

2. TVA will evaluate the remaining control air system soldered connections (e.g., those currently in high radiation areas) whose failure could cause a reactor scram to determine if they need to be inspected and will develop an inspection schedule.

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## VI. ADDITIONAL INFORMATION

### A. Failed Components:

Air supply line soldered connection to steam packing exhaust bypass FCV.

### B. Previous LERs on Similar Events:

No other previous reactor trips involving the closure of the steam packing exhaust bypass control valve were identified. However, on December 6, 1989, an unexpected failure of a soldered connection on the control air filter inlet pressure indicator for the control rod drive system AA! occurred resulting in a reactor protection system actuation (LER 260/89028). In the December 6, 1989 event, instrument and calibration personnel were calibrating the pressure indicator at the time of the event. However, in the September 14, 1991 event no craft personnel were working on the FCV at the time of the event.

## VII. Commitments

1. TVA will inspect, by visual examination using liquid leak detection solution, readily accessible control air system soldered connections whose failure could cause a reactor scram. TVA expects to complete these inspections by January 23, 1992.

2. TVA will evaluate the remaining control air system soldered connections (e.g., those currently in high radiation areas) whose failure could cause a reactor scram to determine if they need to be inspected and will develop an inspection schedule. TVA expects this to complete these actions by January 23, 1992.

Energy Industry Identification System (EIIS) codes are identified in the text as XX!.

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TVA

Tennessee Valley Authority, Post Office Box 2000, Decatur, Alabama 35609

O. J. "Ike" Zeringue  
Vice President, Browns Ferry Operations

OCT 15 1991

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, D.C. 20555

Dear Sir:

TVA - BROWNS FERRY NUCLEAR PLANT (BFN) UNIT 2 - DOCKET NO. 50-260 -  
FACILITY OPERATING LICENSE DPR-52 - LICENSEE EVENT REPORT  
LER-50-260-91017

The enclosed report provides details concerning a condition which resulted in manual and automatic actuation of engineered safety features including reactor protection system. This report is submitted in accordance with 10 CFR 50.73(a)(2)(iv).

Sincerely,

O. J. Zeringue

Enclosure  
cc: see page 2

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U.S. Nuclear Regulatory Commission

OCT 15 1991

cc (Enclosure):  
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